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Abstract

This paper analyzes the impact of labor mobility on old-age pension systems. We develop a dynamic model, in a OLG setting, with national pay-as-you-go (PAYG) social security systems and two types of workers. The countries may differ in their Bismarckian or Beveridgean nature, i.e., the intragenerational redistribution level. The native population chooses a tax rate to finance the PAYG system by majority voting. After the voting decision has taken place, the low-skilled may migrate. Pensions are paid by the country where one works in the first period of life. We characterize the outcome of the voting game and show under which conditions (one or two) social security systems arise in equilibrium. The low-skilled always migrate from the less to the more intragenerational redistributive country. We analyze the welfare implications of mobility and show that the mobile population may loose, and the immobile may gain, from mobility. Finally, we show that the political equilibrium is generally inefficient.

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1 Introduction

Most pension systems (and more broadly the welfare systems) in European Union countries were introduced in the turn from the XIX to the XX century and were consolidated in the 50's, in a context where the integration of markets was just beginning. Today, at the European Union level, free mobility of goods, services, capital and labor is more than a goal - even if to different extents, the single market is a reality. Nevertheless, despite the significant achievements so far, the European integration is still hampered by different national regulations, non-harmonized national taxation policies and national welfare systems.[1] Social security policy decision at the EU level still requires unanimity and the most ambitious EU-wide initiatives entail a great degree of flexibility, like the so-called Open Method of Coordination.

When designing a national pension system with integrated markets, one must take into account not only the objectives and sustainability of the system (as with non-integrated markets), but also the incentives that the different national designs create in different markets, in particular the factors markets. Standard fiscal competition literature would advise that the relevant market of the tax base should determine the level of government at which the policy is set up. Asymmetric systems, both in terms of income redistribution and/or in terms of intergenerational redistribution, may therefore distort the allocation of labor. Global efficiency and national redistributive policies are, therefore, at stake.

What is the empirical relevance of these mechanisms? It is sometimes argued that despite the theoretical free mobility of labor, some barriers (like cultural differences, for example) are still dominant. According to Eurostat (2009), in 2008 the net migration rate of the EU was almost three times as high as the rate of natural population growth, with 6,2% of the EU population being non-national. Citizens of other EU countries represent 37% of total non-nationals. The relevance of the mobility of labor within EU countries is, therefore, non-negligible. But, if it is true that labor is, at least to some extent, mobile within the EU, it is also true that migration would entail costs (pecuniary, like settling cost, or non-pecuniary, like the cost of being far from home or the cost of learning a new language). So, mobility induced from different pension schemes only arise if the potential benefits are significant. Wildasin (1997) estimated the net public pension wealth (negative for net contributors to the system and positive for net beneficiaries) for some EU countries and concluded that, for some particular combinations of origin and destination countries, the gains from moving to one country to the other may reach 25% of lifetime wealth.

The European Union is a good example of asymmetric pension systems. If, on the one hand, one may speak of an European social model with distinctive features from the rest of the world (as discussed, for example, in Cousins (2005), pp. 239-241), on the other hand, we are far from a common European welfare state. In fact, the welfare states of the EU countries remain a national responsibility and they differ substantially

[1] In addition to this, even the single currency or the Schengen convention are not applied uniformly across the European Union.

from one country to the other, both in size and in level of redistribution.

The size of a public pension system may be evaluated by its share of expenditure in the GDP. In the EU it is possible to distinguish between low and high spending countries, as shown in Table 1. In particular, Germany, Hungary, Portugal, Poland, Greece, Austria, France and Italy present above average pension expenditures. In 2007, the maximum expenditure was 2,7 times the minimum one and the projections presented in the Commission Ageing Report 2009 (European Commission, 2009) point to an increase to 3,6 in 2035 and 4,9 in 2060.

Ireland	5,2	Czech Republic	7,8	**European Union 15**	10,2
Latvia	5,4	Bulgaria	8,3	Germany	10,4
Estonia	5,6	Spain	8,4	Hungary	10,9
Cyprus	6,3	Luxembourg	8,7	**Euro Area**	11,1
Netherlands	6,6	Denmark	9,1	Portugal	11,4
Romania	6,6	Sweden	9,5	Poland	11,6
United Kingdom	6,6	Slovenia	9,9	Greece	11,7
Lithuania	6,8	Belgium	10,0	Austria	12,8
Slovak Republic	6,8	Finland	10,0	France	13,0
Malta	7,2	**European Union 27**	10,2	Italy	14,0

Table 1: Public pensions expenditures as a share of the GDP in the European Union (source: European Commission (2009), p. 26)

The degree of redistribution of the pension systems may range from Beveridgean (flat rate systems) to Bismarckian (earnings related systems), according to the common taxonomy. In the first case, income in retirement is seen as a means to ensure a subsistence level in old-age whereas in the second case the purpose is to keep the standards of living even after retirement. In the EU, the majority of the countries are *more* Bismarckian but there are also some countries with at least partially Beveridgean systems. In general, the high-spending countries are *more* Bismarckian while low-spending countries present greater heterogeneity, ranging from Beveridgean to Bismarckian.[2]

We shall study PAYG financing, which is the financing system adopted in the majority of EU countries. In a PAYG setting, the mobility of labor entail different effects depending on the direction (emigration vs. immigration), composition (low-skilled vs. high-skilled migration) and intensity of the flow (a small fraction vs. a large fraction of the population).[3]

[2]The classification of countries by type of system is based on the information provided under European Commission (2009), Annex 1: Pensions, 8.1 Overview of pension systems in the member states, pp.177-185.

[3]The integration of capital markets is particularly interesting in a context where the financing of the

In the literature, there are some papers that address the question of labor mobility and redistribution: usually intergenerational redistribution (across generations) is analyzed in a dynamic framework whereas models of intragenerational redistribution (across income levels) are built in static frameworks. On the first class of papers, Homburg and Richter (1993) developed a simple OLG model in a multi-jurisdiction setting with integrated markets. Households are homogeneous (ruling out redistribution across income levels) and the PAYG pension scheme is designed with exogenous and time invariant pension contributions (pension benefits adjust passively to ensure the balancing of the system). They conclude that only a centralized pension system is efficiency preserving. Breyer and Kolmar (2002) built on this work, showing that the harmonization of contributions is not only a necessary condition (as shown before by Homburg and Richter (1993)) but also a sufficient one to ensure efficiency. They further extend the model to allow for mobility costs, finding, in this setting, much more restrictive conditions for an efficient allocation of resources.

Concerning the second branch of the literature, Cremer and Pestieu (1998) develop a static model of intragenerational redistribution, to study the political economy of social insurance, introducing the so-called *Bismarckian factor*. The type of social insurance (with Bismarckian and Beveridgean systems at the extremes) is chosen at a constitutional stage (*behind the veil of ignorance*) and then the tax rate to finance the system is decided through majority voting, considering that some agents are mobile. They conclude that the type of mobility (poor vs. rich) plays an important role on the tax competition outcome. Furthermore, at the constitutional stage countries adopt more than optimal Bismarckian systems but these systems are not necessarily more tax competition proof. The model of Cremer and Pestieau (2003), focusing on low-skilled mobility, study the sustainability of Bismarckian and Beveridgean systems within an economic union. They show that it is possible that all poor households move to the Bismarckian country. In both papers, wages are fixed.

Razin and Sadka (2000) and Kolmar (2007) combine inter and intragenerational redistribution in a setting with fixed factor prices and exogenously given time invariant tax rates. In the first paper, migration is a one-time episode, of a given fixed amount. The authors show that migration is beneficial for all skill levels and for young and old households. The model is generalized to include flexible factor prices and, through simulations, it is shown that the positive effects discussed in the fixed factor prices setting are weakened and may even disappear. The paper of Kolmar (2007) extends the static analysis of Cremer and Pestieau (2003) to a dynamic setting, confirming the main results.

In a context of endogenous determined tax rates, differing from one period to the other, the dynamic setting poses an important difficulty: the future pension depends on the unknown future tax rate and thus the households budget constraint is ill-defined.

systems differ from one country to the other, namely to study the interaction of pay-as-you-go (PAYG) and fully funded (FF) schemes. See, for example, Casarico (2000) for competing PAYG and FF systems or Pemberton (2000), for the analysis of the shift from PAYG to FF. Competing PAYG systems may also be studied in a context of integrated capital markets, as in Pemberton (1999).

Tabellini (2000) introduced altruism and quasi-linear preferences in a no mobility setting with exogenous wages to study the political economy of social security with voters taking future taxes as given, avoiding, in this way, the problem of the unknown tax rates. Casamatta et al (2000), also in a model without labor mobility and in a fixed wage setting, circumvent the problem by assuming that the agents consider that the tax rate will be fixed forever.

In this paper we combine the features of the referred models, developing a dynamic OLG model with national PAYG systems and heterogeneous workers, allowing for both types of redistribution: across income levels and across generations. Wages, equal to the marginal productivity of labor, responde to labor mobility. The dimension of the system (measured by the tax rate) is endogeneized through a voting stage and the pension formulation includes a *Bismarckian factor*, to encompass the diversity of the European Union. Voters are myopic, in the sense that they are not able to assess *ex-ante* the impact of pensions on mobility (notice that mobility will depend on both countries voting outcome).[4]To circumvent the limitation of unknown future tax rates, we assume that a young household perceives a link between her own pension and the current pension received by her type of retirees. If the perceived link is high it means that the agents identify the pension system with savings whereas if the link is small the pension system is seen as a tax, with no direct benefits associated.[5] It is reasonable to think that contributors use the current pensions as a reference when assessing their own future pension benefits, given the enormous amount of foresight needed to accurately estimate future pensions (that depend on the future tax rate, future wages and future population). Our goal is to understand the incentives that different pension systems impose on labor mobility and the resulting effects on the welfare of the agents and on global efficiency.

The remainder of the paper is organized as follows. Section 2 presents the model. In Sections 3 and 4 we derive and discuss the voting and the migration equilibria. In section 5 we assess the welfare impact of mobility. Section 6 investigates the conditions under which competing pension systems are compatible with global efficiency. Finally, Section 7 concludes.

[4]The assumption of non-myopic agents would imply very sophisticated agents since, as mentioned, they would have to consider the interaction between the voting decisions of both countries. The lower the financial education of the agents and the higher the complexity of the welfare system (pension systems are an example of particularly complex systems), the more realistic the assumption of myopic voting. Indeed, myopic agents are a common assumption in the literature (see, for example, Epple et al (1984), in the context of a static model). Some authors develop models where agents are sophisticated (as is the case of Cremer and Pestieu (1998), presented above, or Epple and Romer (1991), in a static housing market model). Usually, the modeling of non-myopic agents require additional simplifying assumptions or the use of simulations. In the context of the housing market model, Calabrese et all (2006) show that myopic voting is empirically relevant when one controls for peer effects.

[5]This perception of the pension system as savings or as a tax was first discussed by Feldstein and Liebman (2002), to analyze labor supply effects of pensions.

2 The model

To capture the dynamics of the pension systems we develop an overlapping generation model. In our setting, there are two small open economies differing only in their pension systems. There is free mobility of goods and services, capital and labor. The countries are populated by heterogeneous workers that consume a single homogeneous good, produced by competitive firms. The government of each jurisdiction provides pensions to the elderly, totally financed by the young generation. The pension systems of both countries may diverge in size and in the level of redistribution across income levels: the size is determined by majority voting whereas the redistribution level is given and specific to the country. Mobile workers vote also with their feet, by deciding in which country they want to live.

2.1 The Households

In each country (A and B) there are two types of workers, namely the high-skilled (h) and the low-skilled (l).[6] The natural population change in each country is given by a constant rate γ ($\gamma > -1$, meaning that if there are old households in a country, the native young are non-zero). We assume that only low-skilled workers are mobile (as in Cremer and Pestieau (2003)).[7] In fact, one may find evidence that low-skilled mobility is indeed more relevant than the high-skilled one (see, for example Bellot and Hatton (2009) and OECD (2009)).

The households live for two periods. When young (period 1) they work (supplying inelastically one unit of labor), contribute to the pension system and, possibly, save; when old (period 2) they retire, receive a pension benefit and consume their savings (plus interest).[8] The households are utility maximizers over consumption and their lifetime utility is given by:

$$W_t^{y,i} = U(c_t^{y,i}) + \frac{1}{1+\rho} U(c_{t+1}^{o,i}), \quad i = h, l. \tag{1}$$

where y and o represent, respectively, the agent when *young* and the agent when *old* and c denotes consumption. As we are assuming no credit constrains, the intertemporal discount factor ρ matches the international interest rate r (taken as given by the two small open economies).

[6] For simplicity of notation we henceforth omit the jurisdiction index. Unless otherwise stated, all the variables are country specific. We will return to the country indices wherever necessary.

[7] Other options may be found in the literature: for example, Cremer and Pestieau (1998) analyze both types of mobility separately in a static framework with fixed wages and Kolmar (2007) considers mobility of high and low-skilled simultaneously, in a setting of fixed factor prices and exogenous tax rate.

[8] In order to isolate the effects of pension schemes, distortions coming from the labor-leisure choice are assumed away.

The intertemporal household budget constraint is given by:

$$c_t^{y,i} + \frac{c_{t+1}^{o,i}}{1+r} = w_t^i - d_t^i + \frac{p_{t+1}^i}{1+r}, \qquad i = h, l \tag{2}$$

where w represents the wage (there are different wages for different skill levels), d is the pension scheme contribution of the young and p is the pension received upon retirement by the old. This restriction may be re-written as:

$$c_t^{y,i} + \frac{c_{t+1}^{o,i}}{1+r} = w_t^i - d_t^i + \frac{\beta p_t^i}{1+r}, \tag{3}$$

where β represents the household's perceived link between contributions and benefits. A β lower than one means that the young household perceives the pension tomorrow as smaller than the one paid to the old today (financed with the young households contributions). In the terminology of Feldstein and Liebman (2002), a higher β means that the households see the pension system as savings (even if with a return different from the market return); a lower β implies that the pension scheme is perceived as a tax with reduced or no direct benefits associated.

Low-skilled households are free to migrate at the beginning of their lives (labor, unlike capital, is only mobile within countries A and B). The retirement benefit is paid by the jurisdiction where the household worked during the first period of life and where she paid her contributions.[9] Let θ^h be the proportion of high-skilled agents in the young population of the country, with $\theta^h + \theta^l = 1$.

2.2 The Firms

We assume that the firms are perfectly competitive and produce a single homogeneous good according to a common time invariant decreasing returns to scale (DRS) production function (with the inada conditions verified), using both capital and labor (high and low-skilled):

$$F(K_t, L_t) = K_t^{\phi} L_t^{\eta}, \quad \phi > 0, \eta > 0, \phi + \eta < 1. \tag{4}$$

where

$$L_t^i = a N_t^{i,h} + N_t^{i,l}, \qquad a > 1, i = A, B. \tag{5}$$

is labor measured in efficiency units, a being the productivity of the high-skilled and K_t is capital.[10]

[9] This is in line with the current framework within the European Union (the residency principle, as opposed to the origin principle). This is also the reason why we can disregard mobility after retirement, since pensions will always be paid by the countries where the household worked. If we think of sources of heterogeneity between countries others than the pension schemes, then the old may as well have incentives to move (different VAT rates, health system, climate, etc.).

[10] With r given and Constant Returns to Scale, $\frac{K}{L}$ would be given. In our setting, we assume DRS thus this result does not apply.

Profit maximization implies that marginal productivities match factor prices:

$$\frac{\partial F}{\partial K_t} = r \Leftrightarrow K_t = \left(\frac{\phi}{r}\right)^{\frac{1}{(1-\phi)}} L_t^{\frac{\eta}{(1-\phi)}} \tag{6}$$

Incorporating (6) of K in the firm's first order condition for low-skilled labor, one gets the low-skilled wage level:

$$\frac{\partial F}{\partial N_t^l} = w_t^l \Leftrightarrow \left(\frac{\phi}{r}\right)^{\frac{\phi}{(1-\phi)}} \eta L_t^{\frac{\phi+\eta-1}{(1-\phi)}} = w_t^l \tag{7}$$

In addition $aw_t^{i,l} = w_t^{i,h}$, $i = A, B$.

2.3 The Government

In each jurisdiction, the government provides pensions to the old households financed by the contributions of the young. The pension has two components: a flat or Beveridgean component, equal across income levels, and an earnings related or Bismarckian component, that depends on the worker's income level:

$$p_{t+1}^i = \tau_{t+1}[(1-\alpha)\bar{w}_{t+1}\frac{N_{t+1}}{N_t} + \alpha w_{t+1}^i \frac{N_{t+1}^i}{N_t^i}], \quad i = h, l. \tag{8}$$

where $\bar{w}$ represents the average wage:

$$\bar{w}_{t+1} = \frac{N_{t+1}^h w_{t+1}^h + N_{t+1}^l w_{t+1}^l}{N_{t+1}} \tag{9}$$

The intragenerational redistribution factor α may range from zero, where maximum income redistribution is achieved, to one, where minimum income redistribution takes place. The tax rate of the jurisdiction, τ, determines the size of the pension system: the larger the tax rate, the bigger the system. In addition to the tax rate, the pension increases with the wage level and the population growth.

Notice that the pension formulation given in equation (8) is compatible with the government's balanced budget requirement:

$$\tau_{t+1}(N_{t+1}^h w_{t+1}^h + N_{t+1}^l w_{t+1}^l) = (N_t^h p_{t+1}^h + N_t^l p_{t+1}^l) \tag{10}$$

2.4 Timing

The timing of the model is as follows: at the beginning of each period the natives vote to choose the tax rate, given the level of redistribution announced by the government. The

intragenerational redistribution factor α is exogenous.[11] Due to the bounded rationality discussed before, households do not foresee the impact of pensions on mobility in their voting decision. When the outcome of the voting process is known, each low-skilled worker decides in which country she wants to live. The residents of each country contribute to the system of that country and, upon retirement, receives a pension which is financed with the contributions of the next period residents of that same country.

3 The voting stage

We now turn to the households maximization problem. At period t+1, the representative household maximizes lifetime utility (1) subject to her budget constraint (3) and her pension, given by (8).[12] Using (8) in (3) one gets:

$$c^{y,i}_{t+1} + \frac{c^{o,i}_{t+2}}{1+r} = w^i_{t+1}(1-\tau_{t+1}) + \frac{\beta\tau_{t+1}}{1+r}[(1-\alpha)\bar{w}_{t+1}\frac{N_{t+1}}{N_t} + \alpha w^i_{t+1}\frac{N^i_{t+1}}{N^i_t}], \qquad i = h,l \quad (11)$$

At this stage, an assumption must be made about the way agents perceive the link between N^{t+1} and N_t and, also, between N^i_{t+1} and N^i_t. The household uses the current pension as a proxy for her future pension benefit but she does not expect that an inflow or outflow of workers today will continue forever. Hence, even though population growth may be large today due to mobility, such growth is not sustainable. The household expectation on population growth is, therefore, the natural population growth.[13]

Solving the maximization problem for consumption, one gets, not surprisingly, that the agents wish to smooth consumption across periods. Lifetime income will depend positively on the natural population growth and on β, since they increase the intergenerational redistribution. Contrary, an increase in the international interest rate decreases the value of the future pension benefit. Notice also that the impact of the tax rate on the agent's lifetime income is given by $\frac{\beta(1+\gamma)}{1+r}[(1-\alpha)\bar{w}_{t+1} + \alpha w^i_{t+1}] - w^i_{t+1}$, hence there is a threshold level of redistribution α above which a low-skilled agent (respectively a high-skilled agent) prefers a zero (respectively unit) tax rate. The α for which the household is indifferent between $\tau = 0$ or $\tau = 1$ is given by the equalization of the returns of the outside option and of the pension system:

$$\tilde{\alpha}^i_{t+1} = \frac{\frac{w^i_{t+1}(1+r)}{\beta(1+\gamma)} - \bar{w}_{t+1}}{w^i_{t+1} - \bar{w}_{t+1}}, \qquad i = h,l \quad (12)$$

[11] The same approach is followed by Casamatta et al (2000). The level of redistribution may be seen as determined by historical/ideological reasons as seems to be the case in the European Union. An alternative would be to consider, as in Cremer and Pestieau (1998), that the Bismarckian factor is chosen in a constitutional stage by authorities who maximize the welfare of their jurisdiction natives.

[12] We start at $t+1$ so that the contemporaneous old households have the subscript t.

[13] We show in the appendix that this expectation is, in most cases, confirmed.

In general, high income redistribution benefits the low-skilled while harming the high-skilled. Above the indifference level (a higher α represents less redistribution of income from the high-skilled to the low-skilled), a low-skilled would favor a tax rate equal to zero whereas a high-skilled a maximum tax rate. We shall say that a voter who prefers $\tau = 1$ *supports* the pension system. [14] Notice that the indifference α is, in general, different for low and high-skilled agents.

Using the high-skilled and low-skilled wage relationship ($aw^l_{t+1} = w^h_{t+1}$) , equation (12) may be re-written as:

$$\tilde{\alpha}^h_{t+1} = \frac{\frac{a(1+r)}{\beta(1+\gamma)} - [1 + \theta^h_t(a-1)]}{(a-1)(1-\theta^h_t)} \tag{13}$$

$$\tilde{\alpha}^l_{t+1} = \frac{\frac{(1+r)}{\beta(1+\gamma)} - [1 + \theta^h_t(a-1)]}{(1-a)(\theta^h_t)} \tag{14}$$

A few properties can be derived from (13) and (14): improving the outside option, as measured by r, reduces the range of α for which the households support the pension system. On the contrary, a higher return of the pension system, measured by the link between contributions and pensions (β) or by the natural growth rate of the population (γ), reduces the range of α for which voters prefer $\tau = 0$, increasing the support for the pension system.

For future reference, notice that one may equivalently define a β threshold, given by:

$$\tilde{\beta}^h_{t+1} = \frac{a(1+r)}{(1+\gamma)[1 + \theta^h_t(a-1) + (a-1)(1-\theta^h_t)\alpha^h_{t+1}]} \tag{15}$$

$$\tilde{\beta}^l_{t+1} = \frac{(1+r)}{(1+\gamma)[1 + \theta^h_t(a-1) + (1-a)\theta^h_t\alpha^l_{t+1}]} \tag{16}$$

For sufficiently high β (above the indifference level just defined), the households vote $\tau = 1$.

3.1 A benchmark

It is instructive to begin by analysing the case where the two jurisdictions have respectively $\alpha^B = 0$ and $\alpha^A = 1$: in country B there is a flat rate whereas in country A there is no intragenerational redistribution. The countries are symmetric in all respects except in the design of the welfare system. Notice that there are only two possible Condorcet winners: $\tau = 0$ and $\tau = 1$. The voting preferences of the native are summarized in Table 2.

[14] Throughout the paper we assume that indifferent households vote according to the preferences of their parents.

	Country A	**Country B**
Old Low-skilled	Always	Always
Old High-skilled	Always	Always
Young Low-skilled	$\beta^A > \tilde{\beta}^{A,l}$	$\beta^B > \tilde{\beta}^{B,l}$
Young High-skilled	$\beta^A > \tilde{\beta}^{A,h}$	$\beta^B > \tilde{\beta}^{B,h}$

Table 2: Range of parameter values for which each type prefers $\tau = 1$

The values of β that leave the natives of each country indifferent between having a pension system or not are given by the equalization of the rates of return of the pension system and the outside option[15]:

$$\tilde{\beta}^{B,i}_{t+1} = \frac{(1+r)w^{B,i}_{t+1}}{(1+\gamma)\bar{w}^{B}_{t+1}}, \qquad i = h, l \tag{17}$$

$$\tilde{\beta}^{A,i}_{t+1} = \frac{(1+r)}{(1+\gamma)}, \qquad i = h, l \tag{18}$$

In country A, the return of the pension system is equal for both types of agents. They are indifferent between the earnings related pension system and the outside option if β exactly offsets the difference between the returns of both options (r and γ). In country B, benefits are of the flat rate type and, therefore, the return of the pension system are different for low and high-skilled agents. In particular, the high-skilled, for whom income redistribution is harmful, requires a higher β to be indifferent between having a pension system or not. Using the relation between high- and low-skilled wages, (17) may be re-written as:

$$\tilde{\beta}^{B,l}_{t+1} = \frac{(1+r)}{(1+\gamma)[1+(a-1)\theta^h_t]} \tag{19}$$

and $\tilde{\beta}^{B,h}_{t+1} = a\tilde{\beta}^{B,l}_{t+1}$.

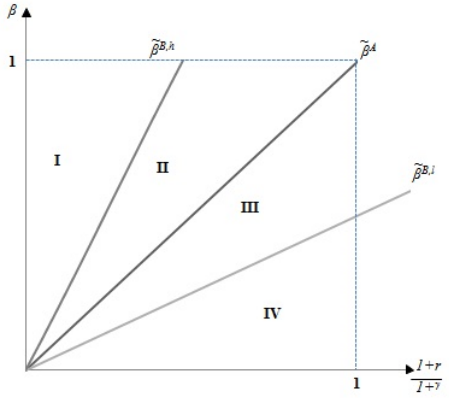
If the market interest rate increases, the relation between contributions and pensions has to increase in order to compensate for the larger outside option. Similarly, if the return of the pension is lowered through a decrease in the natural growth rate, the indifference β increases to outweigh the negative impact of γ.

[15]In the particular case where the redistribution levels are either maximum or minimum, we focus on indifference β. Our purpose is to determine how high the perceived link between benefits and contributions has to be to ensure that agents support the pension system (in the two extreme cases of flat rate pension and earnings related pension). However, beyond the benchmark analysis, the value of α is not anymore constrained to 0 or 1 (in fact, it can take any value in the interval [0,1]) and we return to the comparison of indifference α. In this general case, our goal is to assess for which levels of redistribution is a pension system sustainable.

The results may be summarized as follows:

Proposition 1 (Voting equilibria - benchmark case) *Suppose country B is completely Beveridgian ($\alpha^B = 0$) and country A is completely Bismarckian ($\alpha^A = 1$). Then, if β is sufficiently high, there is a pension system in both countries. For intermediate values of β, there is a pension system only in country B. Finally, when β is low there is no pension system in either country.*

The results in Proposition 1 are illustrated in Figure 1. Considering values of β lower than 1, as long as the outside option has a higher return than the intergenerational pension component (γ) then we will never have pension systems in both countries. We may, however, have a pension system in country B.



Legend

I and II	Pension system in both countries
III	Pension system only in country B
IV	No pension system in country A nor country B

Figure 1: Voting outcomes - benchmark case

The intuition for Proposition 1 is the following. If β ensures a sufficient return (i.e. a return of the pension system higher than the return of the outside option) agents vote for the pension system. As the perceived link between contributions and benefits is reduced (in other words, as pensions are seen more as a tax with no direct benefit associated and less as savings), the support for the pension systems is also reduced. If governments would have the power to, at least to some extent, affect β, they would have the ability to indirectly affect the voting outcome. In region I of figure 1 the link between contributions and benefits is perceived as high by all. Therefore, the young, low and high-skilled, vote in the some way as the old: a tax rate equal to 1. In region II, the link is perceived as somewhat lower, but still enough for the young of country A (where there is no redistribution). The same applies for the low-skilled young of country B, since, despite the lower β, income redistribution is favoring them. For the high-skilled young in B, the β is not anymore sufficient to cover for the unfavorable redistribution of income and they vote against the pension system. However, with the votes of the old generation in B, the tax rate equal to 1 still wins the voting stage. In region III, the perceived β is now lower and only the young agents in B, benefiting from the income

redistribution, are still favoring the pension system. Again, together with the votes of the old, a tax rate equal to 1 wins in country B. In country A the majority favors no pension system, given the low return associated with it (the low β). Finally, in region IV, even the young low-skilled of country B are not anymore voting for the pension system since the return is too low. In this case, no country adopts a pension system.

3.2 General level of redistribution

We now generalize the previous section, by assuming that the countries adopt a general value of α. Without loss of generality, we consider that country B is more intragenerational redistributive than country A, i.e. $\alpha^B < \alpha^A$. The voting preferences of the households in each country are summarized in Table 3 (remember that $\tilde{\alpha}$ is given by the equalization of the returns of the pension system and the outside option, as presented in equations 12 to 14).

	Country A	**Country** B
Old Low-skilled	Always	Always
Old High-skilled	Always	Always
Young Low-skilled	$\alpha^B < \tilde{\alpha}^{A,l}$	$\alpha^B < \tilde{\alpha}^{B,l}$
Young High-skilled	$\alpha^B > \tilde{\alpha}^{A,h}$	$\alpha^B > \tilde{\alpha}^{B,h}$

Table 3: Range of parameter values for which each type prefers $\tau = 1$

We are thus able to establish the following results:

Proposition 2 (Voting equilibria - general redistribution level) *Suppose country B is more intragenerational redistributive than country A ($\alpha^A > \alpha^B$). Then, when β is sufficiently high, there is a pension system in both countries. When β is low, then each country will have a pension system if it is sufficiently Beveredgian. In particular, it may happen than country B has a pension system while A does not, but not the reverse.*

The intuition is simple: if the return of the earnings related component of the pension system $\beta(1+\gamma)$ is greater or equal than the return of the outside option, the low-skilled always have higher returns from the pension system than from the market, independently of its Bismarckian nature. If the pension system is a good deal without intragenerational redistribution, then it is even a better one with it. The votes of the low-skilled, together with the old generation ones, ensure a majority favoring the system (in the case of strict inequality of returns, high-skilled will also favor the pension system if the level of redistribution is sufficiently low). On the contrary, if $\beta(1+\gamma) < (1+r)$ high-skilled workers will always vote against the system. This happens because, even in their best

Legend	
I, II, III, IV, VII	Pension system in both countries
V	Pension system only in country B
VI	No pension system in country A nor country B

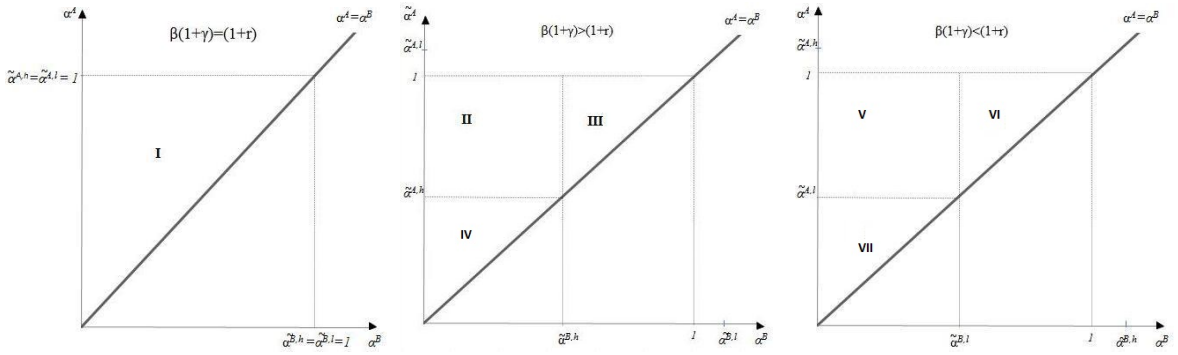


Figure 2: Voting outcomes: general redistribution levels

case scenario, a pure Bismarckian system, they already have returns lower than the outside option. The low-skilled may, nevertheless, vote for the system provided that a certain amount of income redistribution is ensured.

Figure 2 presents the possible voting outcomes, conditional on the returns. Old agents always vote for $\tau = 1$, hence we concentrate on the young agents decision. When $\beta(1+\gamma) = (1+r)$, the intragenerational indifference levels of low and high-skilled agents coincide and are both equal to 1 (the pure Bismarckian setting) and the voting outcome is $(\tau^A, \tau^B) = (1, 1)$ with the support of the young low-skilled. If $\beta(1+\gamma) > (1+r)$ the indifference level of the low-skilled is greater than 1 whereas the one of the high-skilled is lower than 1 hence the voting equilibrium is $(\tau^A, \tau^B) = (1, 1)$: in case II with the support of young low-skilled and, in country B, also of the young high-skilled, in case III by unanimity and in case IV with the support of the young low-skilled. Finally, if $\beta(1+\gamma) < (1+r)$ the indifference level of the high-skilled is greater than 1 whereas the one of the low-skilled is lower than 1. In this setting, it is no longer guaranteed that both countries will have a pension system. In fact, only in case VII we manage to have $(\tau^A, \tau^B) = (1, 1)$, with the votes of young low-skilled. In case V, the result is $(\tau^A, \tau^B) = (0, 1)$, with only young low-skilled of country B favoring the system and in case VI no pension system arises, with the votes of the young against the system.

4 Mobility

4.1 A benchmark

The low-skilled households migrate to the country that ensures a higher lifetime income. Hence, a migration equilibrium is achieved when the lifetime income of the low-skilled agents of both countries is equalized (or if all mobile agents are located in one of the countries and their lifetime income is greater there). We know from section 3.1 that three voting outcomes may arise: pension systems in both countries, pension system only in country B and no pension system in both countries. In what follows, we shall concentrate on the cases where a pension system exists in at least one of the countries (country B). It is obvious that when the political equilibrium is no pension system in either country, there is no incentive to move. If at least country B has a pension system, low-skilled agents migrate from the non-intragenerational redistribution country to the intragenerational redistribution one. In the case $(\tau^A, \tau^B)^* = (0, 1)$ only country B has a majority favoring the pension system. The no migration condition is given by the equalisation of lifetime income (RHS of equation 11) of both countries:

$$\bar{w}^B_{t+1} \frac{\beta(1+\gamma)}{(1+r)} = w^{A,l}_{t+1} \tag{20}$$

Using the relation between the wages of high-skilled and low-skilled agents and the fact that $\tilde{\beta}^A > \beta > \tilde{\beta}^{B,l}$, it is easy to conclude that the low-skilled flow from country A to country B. This result follows directly if we aknowledge that the comparison of incomes of both countries that drives the migration decision amounts exactly to the tax rate decision of the low-skilled voter of country B.

If the two countries adopt a pension system ($(\tau^A, \tau^B)^* = (1, 1)$), the no migration condition is given by:

$$\bar{w}^B_{t+1} = w^{A,l}_{t+1} \tag{21}$$

Before migration, the lifetime income in country B is higher than the one in country A and therefore low-skilled workers flow from A to B. This result arises because we are assuming that the countries have the same natural growth rate of population and, also, that the natural growth rate is the same for high and low-skilled agents. Therefore, intergenerational redistribution is assumed to be symmetric in both countries and thus, in this case, intragenerational redistribution is the sole determinant of the direction of migration.

4.2 General level of redistribution

We now turn to the general redistribution level case ($\alpha^B < \alpha^A$, without loss of generality).

The migration outcome is similar to the one described in proposition **??**:

Proposition 3 (Migration equilibria) *Suppose country B is more intragenerational redistributive than country A ($\alpha^B < \alpha^A$). Then, if at least one country adopts a pension system, the proportion of low-skilled workers in the young population increases in country B and decreased in country A.*

The situation where $(\tau^A, \tau^B)^* = (0, 0)$ is trivial. When only country B adopts a pension system ($(\tau^A, \tau^B)^* = (0, 1)$), the no migration condition is given by:

$$[(1-\alpha^B)\bar{w}^B_{t+1} + \alpha^B w^{B,l}_{t+1}]\frac{\beta(1+\gamma)}{(1+r)} = w^{A,l}_{t+1} \tag{22}$$

Before migration this equation is similar to the voting choice of a low-skilled in country B (since the countries are symmetric and therefore initial wages are the same). As the voter preference is $\tau = 1$, before migration the lifetime income in country B is larger than in country A and therefore there is an outflow of workers from A to B. Finally, if both countries adopt a pension system ($(\tau^A, \tau^B)^* = (1, 1)$), the equalization of lifetime incomes is given by:

$$[(1-\alpha^B)\bar{w}^B_{t+1} + \alpha^B w^{B,l}_{t+1}] = [(1-\alpha^A)\bar{w}^A_{t+1} + \alpha^A w^{A,l}_{t+1}] \tag{23}$$

Before migration, the lifetime income is higher in the country with the lower α (i.e. the country with the highest weight on the average income). As we are assuming, without loss of generality, that $\alpha^B < \alpha^A$, migrants move from country A to country B. As in the benchmark case, intragenerational redistribution is playing a key role in the determination of the migration flows since the countries are assumed to have the same natural growth rate of population (also equal for high and low-skilled agents).

Recalling that there is an election in every period, one may wonder about the stability of the political outcome. We shown in the appendix that the voting and mobility equilibria of period $t+1$ are stationary, i.e. the voting equilibrium does not change at any future date.[16]

5 Welfare analysis

In our model only the low-skilled agents are mobile. To assess the impact of the competing pension systems and of the mobility of the low-skilled, we must evaluate the effects of migration on the well-being of the low-skilled and high-skilled workers.

5.1 A benchmark

The impact of mobility on lifetime income of the young households may be summarized as follows:

[16] Only in one special case, stationarity is achieved at period $t+2$.

Proposition 4 (Young agents welfare - benchmark case) *Suppose country B is completely Beveridgian ($\alpha^B = 0$) and country A is completely Bismarckian ($\alpha^B = 1$). Then, if at least one country adopts a pension system, lifetime income increases for young agents of country A (origin country) and decreases for young agents of country B (destination country).*

For a zero tax rate, lifetime income depend solely on the wage level, that decreases with the number of workers. So, an inflow of workers has a negative impact on lifetime income whereas an outflow of workers increases welfare. In the case of a positive tax rate, the impact of mobility on lifetime income in country B ($\alpha = 0$) is given by:

$$\frac{\partial Y^{B,l}}{\partial N^{B,l}_{t+1}} = \frac{\beta(1+\gamma)}{(1+r)} \frac{w^{B,l}_{t+1}}{(N^B_{t+1})^2}[(1-\varepsilon_{w^l,L})N^B_{t+1} - L^B_{t+1}] \tag{24}$$

As the total young population in country B is lower than the total labor force (because a is larger than 1) and since $(1-\varepsilon_{w,L})$ is lower than 1, the impact on lifetime income of an increase in the number of resident low-skilled is negative (note than country B performs maximum redistribution and therefore lifetime income of both types of workers coincide).

In country A, the impact of mobility in lifetime income is given by:

$$\frac{\partial Y^{A,l}}{\partial N^{A,l}_{t+1}} = \frac{\beta(1+\gamma)}{(1+r)} \frac{w^{l,A}_{t+1}}{L^A_{t+1}}[-\varepsilon_{w^l,L}] \tag{25}$$

and $\frac{\partial Y^{A,h}}{\partial N^{A,h}_{t+1}} = a\frac{\partial Y^{A,l}}{\partial N^{A,l}_{t+1}}$.

For both low and high-skilled young workers the impact of an inflow of low-skilled workers is negative, since the elasticity of wages to labor force and the productivity factor are positive.

We now turn to the impact of mobility on welfare of old agents:

Proposition 5 (Old agents welfare - benchmark case) *Suppose country B is completely Beveridgian ($\alpha^B = 0$) and country A is completely Bismarckian ($\alpha^B = 1$). Then, if at least one country adopts a pension system, lifetime income of the old increases in country B (destination country) whereas in country A (origin country) the welfare of the old high-skilled increases while the welfare of the old low-skilled decreases (or remains unchanged for both types of old agents if there is no pension system in the country).*

For old agents, lifetime income is given by equation (8), the pension received upon retirement added to their savings plus interest. In the no tax situation, there is no pension and therefore no impact of the mobility of the low-skilled young on their welfare. With a tax rate equal to 1, the impact of mobility on the welfare of the old in country B is given by:

$$\frac{\partial Y^B}{\partial N^{B,l}_{t+1}} = \frac{1}{N^B_t}[1 - \varepsilon_{w^l,L}] \tag{26}$$

Which is equal for low and high-skilled since we are under the flat rate situation. As in our setting $\varepsilon_{w^l,L}$ is lower than 1, the impact of the increase of low-skilled workers is positive.

In country A, we have the following:

$$\frac{\partial Y^{A,h}}{\partial N^{A,l}_{t+1}} = a(1+\gamma)\frac{w^{A,l}_{t+1}}{N^{A,l}_{t+1}}[-\varepsilon_{w^l,N^l}] \tag{27}$$

$$\frac{\partial Y^{A,l}}{\partial N^{A,l}_{t+1}} = \frac{1}{N^{A,l}_t}[1 - \varepsilon_{w^l,N^l}] \tag{28}$$

For an old high-skilled agent the impact of migration is negative whereas for an old low-skilled the effect is positive.

The reason for these results (for young and old agents) will become clear in the next section, where we discuss the general case.

5.2 General redistribution levels

It turns out that the results in Propositions 4 and 5 allow us to characterize the welfare effects for $\alpha \in (0,1)$, since they are simply a weighted average of the two benchmark cases. We may then establish the two following Corollaries:

Corollary 1 (Young agents welfare - general redistribution level) *Suppose country B is more intragenerational redistributive than country A ($\alpha^B < \alpha^A$). Then, if at least one country adopts a pension system, lifetime income increases for young agents of country A (origin country) and decreases for young agents of country B (destination country).*

Corollary 2 (Old agents welfare - general redistribution level) *Suppose country B is more intragenerational redistributive than country A ($\alpha^B < \alpha^A$). Then, if at least one country adopts a pension system, lifetime income of the old low-skilled increases in country B (destination country) and decreases in country A (origin country), if A also has a pension system (otherwise, remains unchanged for country A). The lifetime income of the old high-skilled in country B increases for high values of redistribution and decreases for low level of redistribution whereas the opposite happens in country A if A also has a pension system (otherwise, remains unchanged for country A).*

The threshold level of redistribution above which the welfare of the old high-skilled decreases in country B and increases in country A is given by:

$$\hat{\alpha} > \frac{\frac{1}{N_t}(1-\varepsilon_{w^l,L})}{\frac{1}{N_t}(1-\varepsilon_{w^l,L})-(a-1)\frac{\partial w^l_{t+1}}{\partial N^l_{t+1}}} \tag{29}$$

The intuition for the above propositions and corollaries is the following: for a young agent, mobility today will have a negative impact via reduction of the wage level. The increase in the number of contributors today does not have any positive impact on individual contributions to the system, since it is assumed that the government budget is balanced at every period. If at the time of mobility, a fund is created and the proceeds spread across future generation, the negative impact of mobility on the destination countries could be reduced or reversed. If it is true that mobile agents increase the number of contributors to the system while young, it is also true that they will increase the number of pensioners when old. Note, however, that the population financing their pensions is also increased, through natural population growth. For the old low-skilled agents, an inflow of low-skilled workers is, in general, welfare increasing since the reduction on current wages is more than compensated by the increase in the number of contributors to the system (given the elasticity between wages and workers). The exception are the high-skilled old agents: in a pure Bismarckian system, the inflow of low-skilled only has a negative impact on wages (since the old age dependency ratio for high-skilled remains unchanged). This negative impact may be partially compensated or even reversed if there is a flat rate component in the pension of the old since, for that component, the negative effect on current wages is compensated by the increase on the number of contributors.

In a nutshell, the young mobile agents are not always benefiting from mobility nor the young immobile agents always loosing from it. The impact for old agents is also mixed.

6 The costs of decentralized decision making

In the previous sections we analyzed the welfare impact of competing pension systems in a context of mobile labor. We now turn to the aggregate impact, i.e., we compare the equlibrium with a benchmark of a federation-level planner who maximizes total output:

$$Y_{t+1} = F(K^A_{t+1}, L^A_{t+1}) + F(K^B_{t+1}, L^B_{t+1}), \quad s.t. \quad N^l_{t+1} = N^{A,l}_{t+1} + N^{B,l}_{t+1}. \tag{30}$$

Global efficiency then implies the equalization of the marginal productivities for the mobile factors. If, as we assume, only the low-skilled are mobile, this condition implies equal wages for the low-skilled (which given the equal productivity factor a across jurisdictions, also implies equal wages for the high-skilled, who are immobile). In our symmetric country setting, the equalization of the marginal productivities of low-skilled labor implies no mobility across countries.

6.1 A benchmark

The case $(\tau^A, \tau^B) = (0, 0)$ is trivial since no migration arises. If $(\tau^A, \tau^B) = (0, 1)$, efficiency is attainable if lifetime incomes are equalized before migration. It can be easily seen that this only happens when β is equal to $\tilde{\beta}^{B,l}$ (equation 19, the value that equalizes the return of the pension system and of the outside option which, in this case, is equivalent to the indifference level for the migration decision (we assume that, in case of equal lifetime incomes, the agent stays in her origin country). Finally, if $(\tau^A, \tau^B) = (1, 1)$, lifetime incomes before migration may only be equalized for equal productivities for low and high-skilled agents, which is not the case ($a > 1$). Therefore, it is not possible to attain efficiency in the benchmark setting (or, in the case where only country B adopts a pension system, it is extremely difficult to ensure no mobility since the perception of the link between contributions and benefits has to be such that the return associated with the pension system matches the returns of the outside option).

6.2 General redistribution levels

For general levels of intragenerational redistribution, efficiency is again achieved by lifetime income equalization before migration. If both countries vote for zero tax rates, no pension systems exists and, therefore, efficiency is sustained. If $(\tau^A, \tau^B) = (0, 1)$, the result is achieved if country B sets it redistribution level equal to the $\tilde{\alpha}^l$. Finally, for $(\tau^A, \tau^B) = (1, 1)$, i.e. if both countries adopt a pension system, only the equalization of redistribution levels allows an efficient outcome.

Proposition 6 (Global efficiency) *To ensure global efficiency national pension systems must be constrained in their intragenerational redistributive ability.*

- *If only one country adopts a pension system, the intragenerational redistribution level of that country must equal $\tilde{\alpha}^l$;*
- *If both countries adopt a pension system, the intragenerational redistribution levels must coincide.*

Efficiency is attainable at the expenses of severe restrictions on the national ability to decide the redistribution levels of the pension systems. This result is due to the fact that, with two symmetric countries only differing on the set up of the pension systems, differences in lifetime income will precisely be determined by the differences in the systems. Efficiency can only be achieved if this differences are neutralized.

7 Concluding remarks

This paper analyses the consequences of decentralized asymmetric pension systems in a context of partial labor mobility. We show that a pension system is supported by a

majority of voters not only if its return exceeds the return of the market; even if the return of the pensions is lower, countries with high intragenerational redistribution may still have a majority favoring the system (as long as the gains from intragenerational redistribution compensate the losses from the lower returns). Also, in the cases where at least one of the countries adopts a pension system, young low-skilled workers migrate to the most generous country (i.e. the country with the higher income redistribution). The low-skilled flow increases the welfare of all young (not only the mobile agents but also the immobile ones) in the origin country and harms the welfare of the young agents (again, mobile and immobile agents) in the destination country. In addition, the competition of two different pension systems has also an impact on the welfare of the old: for low-skilled agents, the welfare in the origin country is reduced whereas in the destination country welfare increases; for high-skilled agents the result also holds for high income redistribution levels and is reversed for low levels of income redistribution. These welfare implications are not obvious and are extremely important for policy design. Finally, we show that mobility distorts the efficient allocation of labor if countries have discretionary power in the definition of their income redistribution levels. Coordination would be crucial to guarantee efficiency. If this coordination is desirable depends on the goals of the pension systems, in particular concerning equity considerations that usually play a relevant role.

Some of our assumptions are important to the results achieved. We assume that the intergenerational redistribution is (contrary to the intragenerational redistribution) equal in both countries (since the natural growth of population is the same). Also, this natural growth rate is equal for low and high-skilled agents. The introduction of asymmetric natural growth rates (across countries and across skill types) would lead to more intricate incentives concerning voting and mobility decisions. Another important assumption concerns the production technology. The substitutability between both types of labor, low and high-skilled, has important welfare implications due to the positive relation between the wage levels. Concerning the government, the balanced budget assumption is also relevant. The possibility of creating a fund would smooth the welfare impact of mobility and, in some cases, potentially reserve its adverse effects. Finally, the type of mobility is also relevant to the results since, in our setting, only the agents that benefit from intragenerational redistribution are allowed to migrate. An obvious extension is to analyze the impact of high-skilled mobility.

Appendix

We show under which conditions the voting equilibrium is stationary. Considering a generic α, one has to distinguish three cases (refer also to figure 2), depending on the relation between the pension system's and market's returns:

Case 1 $(1+r) = \beta(1+\alpha)$

In the first period, the voting equilibrium is $(\tau^A, \tau^B) = (1, 1)$. If the pensions and the outside option have the same return, the indifference α of high and low-skilled

young agents are equal to 1, independently of the proportion of each type of worker in the young population (as is clear from equations 13 and 14). So, the agents' preferences remain the same.

In country B, where migration increased the low-skilled population, the majority favoring a tax rate equal to 1 is reinforced. In country A, if all young low-skilled migrate, the young high-skilled are indifferent between having or not a pension system (since the intragenerational redistribution effect is no longer present - they are all high-skilled - and the returns of the pension system and of the market are the same) and so, vote along with their parents (we assumed before that if indifferent, the agents vote in the same way as their parents). If there are still low-skilled young agents in country A, then those vote for a tax rate equal to 1 (since they are either benefiting from intragenerational redistribution or indifferent between having or not a pension system, thus voting as their parents). The young high-skilled also vote for the maximum tax rate in case of indifference and, for values of intragenerational redistribution below their indifference level (i.e. $\alpha < 1$), vote, as before, for a zero tax rate. In this last setting, under reasonable assumptions, the votes of the old and of the young low-skilled are still enough to guarantee a majority in favor of the pension system.[17] Therefore, in the second period, the outcome of the voting equilibrium remains the same and no further pensions-driven mobility occurs.

Case 2 $(1 + r) < \beta(1 + \alpha)$

In the case where the pensions return exceeds the market return, the voting equilibrium of the first period is given by $(\tau^A, \tau^B) = (1, 1)$. According to equations 13 and 14, $\tilde{\alpha}^l > 1$ and $\tilde{\alpha}^h < 1$ and, also, $\frac{\partial \tilde{\alpha}^l}{\partial \theta^h} > 0$ and $\frac{\partial \tilde{\alpha}^h}{\partial \theta^h} > 0$.

Considering first that no maximum migration occurred, the share of young high-skilled increases in country A and decrease in country B. Therefore, the indifference α of both high and low-skilled young agents increase in country A and decrease in country B. The indifference α of the young low-skilled remain larger than 1 and the indifference α of the young high-skilled is still below 1. Young low-skilled agents always vote for the maximum tax rate. Even in the cases where young high-skilled vote for a zero tax rate (i.e. if $\alpha < \tilde{\alpha}^h$), the equilibrium remains unchanged: in country B, the young low-skilled and the old reinforce their majority and in country A the votes of the young low-skilled together with the votes of the old are, under reasonable assumptions (described in the footnote of case 1), still enough to guarantee that a majority favors the pension system.

In the case where country A is populated solely by high-skilled agents due to migration, the voting equilibrium is again $(\tau^A, \tau^B) = (1, 1)$. The high-skilled of country A no longer take into consideration the intragenerational redistribution (since all agents are the same) and, given the differential of returns, vote for a tax rate equal to 1.

[17] This result holds as long as $\frac{2N^l}{N^h - N^l} > \gamma$. For example, if the relation between low-skilled and high-skilled is 1 to 50, the equation holds for a natural growth rate of the population below 4%.

Case 3 $(1+r) > \beta(1+\alpha)$

As seen before, if the market return exceeds the pension system return, three voting equilibrium may arise: $(\tau^A, \tau^B) = (1,1)$, $(\tau^A, \tau^B) = (0,1)$ or $(\tau^A, \tau^B) = (0,0)$. In the last equilibrium, no pension system arise and, therefore, no migration takes place. Indifference α are constant and the equilibrium is stationary.

If at least one of the countries adopts a pension system in the first period, mobility takes place and the intragenerational redistribution indifference levels are affected. Considering equations 13 and 14, one finds that $\tilde{\alpha}^l < 1$ and $\tilde{\alpha}^h > 1$ and, also, $\frac{\partial \tilde{\alpha}^l}{\partial \theta^h} < 0$ and $\frac{\partial \tilde{\alpha}^h}{\partial \theta^h} < 0$. In country A, the proportion of high-skilled increases, leading to the decrease of the indifference α of both low and high-skilled young agents. The reverse happens in country B: the reduction of the high-skilled share, increases the indifference α of all young agents. In country A and country B $\tilde{\alpha}^l$ remains, nevertheless, lower than 1 and $\tilde{\alpha}^h$ is still higher than 1. Therefore, young high-skilled agents of both countries continue to vote against the pension system (even in the case of maximum migration, where intragenerational redistribution plays no role in country A, young high-skilled of country A still vote against the system since the return of the outside option is higher).

This leaves us with the analysis of the young low-skilled behavior. The voting outcome in the first period, $(\tau^A, \tau^B) = (0,1)$, is clearly stationary: in country A, the young low-skilled vote with the old low-skilled against the system and in country B the majority favoring the system is reinforced due to last period migrants. If the pension systems is adopted by both countries in the first period, one has the following:

(a) if the α of country A is still below the new indifference α of young low-skilled agents in country A and if no maximum migration has occurred, the voting equilibrium remains the same (in country J the majority for the pension system is reinforced and in country A, under reasonable assumptions (footnote of case 1), there is still a majority favoring a tax rate equal to 1);

(b) if the α of country A is still below the new indifference α of young low-skilled agents in country A and if all young low-skilled agents migrated to country B, in the second period young high-skilled agents vote for a zero tax rate, driven by the return differential; and

(c) if the α of country A is above the new indifference α of young low-skilled agents in country A (but still below the original indifference level, given the voting outcome of the first period), young low-skilled of country B (that, due to migration, are more than in the previous period) still vote for a tax rate equal to 1 whereas in country A the young low-skilled favor, together with the young high-skilled, the end of the pension system (the abolition of the pension system in country A also holds in the case of maximum migration since high-skilled young will vote against the system, given the returns of both options).

Therefore, under (b) and (c), the equilibrium $(\tau^A, \tau^B) = (1,1)$ in the first period will became $(\tau^A, \tau^B) = (0,1)$ in the second period. Will this new equilibrium be stationary? If no maximum migration as occurred, one can use the lifetime equal-

ization conditions of both consecutive periods (the condition in the end of period one and the condition in the beginning of period two) to determine the direction of migration: as long as the direction of migration remains (from country A to country B), the new equilibrium is stationary (given the location of α and its relation with the old and new indifference levels). Therefore, to ensure stationarity, the following condition must hold:

$$a > \frac{(1+r)}{\beta(1+\gamma)(1-\alpha)\theta^a_{t+1}} - \frac{\alpha}{(1-\alpha)\theta^a_{t+1}} - \frac{\theta^b_{t+1}}{\theta^a_{t+1}} \tag{31}$$

So, for a sufficiently large productivity differential, the equilibrium of the second period is stationary. In the case of maximum migration, this condition is sufficient to guarantee stationarity (in terms of mobility, stationarity is achieved even in the first period since maximum migration will remain in the following periods).

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